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TREATABILITY STUDY WORKPLAN FOR THE AVERY LANDING SITE AVERY, IDAHO

Revision 2

Submitted to:

Potlatch Land and Lumber, LLC

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1.0 INTRODUCTION

This document is the Treatability Study Workplan for the Avery Landing Site (the Site), prepared by Golder Associates Inc. (Golder) on behalf of Potlatch Land and Lumber LLC (Potlatch).

1.1 Background

The Site is located along and under State Highway 50 about 0.75 mile west of the town of Avery, Idaho (Figures 1 and 2). The Site was originally developed as a railroad roundhouse, maintenance, repair, and fueling depot. There is little remaining at the Site to indicate its previous use. Presently the Site is relatively flat ground with gravel and sparse vegetative growth. The ground is composed mainly of fill, presumably to create a larger flat area for the railroad operations.

Potlatch entered into Administrative Order on Consent (AOC) No 10-2008-0135 with the U.S. Environmental Protection Agency (EPA) to complete an Engineering Evaluation / Cost Analysis (EE/CA) for the Site. In support of the EE/CA, a treatability study will be performed to provide data on potential treatment options.

The following constituents of potential concern (COPCs) have been identified for Site soils:

- Diesel and heavy oil
- Naphthalenes
- PAHs (including carcinogenic PAHs)

Potential treatment technologies include:

- Water treatment
- LNAPL removal
- In-situ biological treatment
- In-situ chemical treatment
- Soil washing
- Land treatment (landfarming)
- Thermal desorption

1.2 Purpose and Scope

The purpose of this workplan is to define and describe the work to be performed to complete the treatability study for the Site in support of the EE/CA.

Water treatment and LNAPL removal technologies will be evaluated in the EE/CA. The effectiveness, implementability and cost of water treatment for the Site COPCs is well understood. Therefore, a treatability study for either groundwater or waste water treatment is not necessary for the EE/CA. Similarly, LNAPL removal is also a well understood technology and will not need a specific treatability study for the EE/CA. In-situ biological and chemical treatment technologies will be

considered in the EE/CA using a literature review and desktop evaluation. Therefore, in-situ treatment is not included in this treatability study.

The scope of this treatability study will focus on size separation and soil washing. This treatment approach is believed to have the highest potential for practical application to the Site. Petroleum compounds typically concentrate in the finer soil fractions (smaller particle sizes). In addition, larger size particles (e.g., boulders, gravel and coarse sand) are typically easier to clean by soil washing than smaller size particles because the larger-size particles have less sorption capacity and are usually simply coated on the surface. However, the extent to which these factors apply can vary considerably in different soils.

By separating clean and contaminated size fractions, size separation reduces the quantity of material requiring disposal or further treatment. Soil washing removes contaminants from soil, thereby eliminating or reducing the quantity of material requiring disposal or further treatment. Even when soil washing does not achieve cleanup levels, the contaminant reduction can reduce the difficulty and cost of further treatment. Thus, soil washing can function as stand-alone treatment, or as pretreatment in conjunction with another technology (e.g., land treatment or thermal desorption).

The objective of the soil washing treatability study will be to determine the residual TPH concentrations in various size fractions after size separation and soil washing. These results will indicate which size fractions require no further treatment after soil washing, and which need either further treatment or disposal. The percentages of the various size fractions will be determined during the study.

The analytical results from the various soil fractions and residuals resulting from soil washing will be compared to cleanup goals. Those fractions and residuals meeting cleanup goals will not require disposal or further treatment.

Those fractions and residuals not meeting cleanup goals will be evaluated for further treatment. First, the estimated costs of off-site landfill disposal, on-site thermal desorption, and on-site land treatment will be compared (assuming for the moment that both treatment technologies would be sufficiently effective). If this cost comparison indicates that on-site treatment warrants further consideration, then the soil fractions and residuals from soil washing that do not meet cleanup goals will be combined into a sample for further treatment testing. In this case, this treatability study work plan will be amended to define the additional treatment studies to be performed for land treatment and/or thermal desorption.

If land treatment is to be considered (based on the cost comparison), then a treatability test would be required to determine effectiveness. However, the specifics of such testing would vary with the nature of the materials to be treated, and is therefore not specified at this time.

Thermal desorption is generally effective on petroleum compounds. Based on analysis of samples obtained during this treatability study (TPH, TOC, moisture, particle size), an approximate cost estimate can be prepared for thermal treatment in the EE/CA. Because of this, it is not expected to be necessary to perform bench- or pilot-scale testing for evaluating alternatives. However, if it appears that thermal treatment will be included in the preferred remediation alternative, then additional treatability testing may be performed to demonstrate effectiveness and better define treatment costs before completing the evaluation of alternatives.

2.0 SOIL WASHING STUDY PLAN

Size separation and soil washing are addressed in an integrated manner in the study plan described in this section. It is anticipated that the bench-scale testing described herein will be performed by ART Engineering (Tampa, Florida) under the oversight of Golder. Laboratory analyses will be performed by Pace Analytical (Seattle, Washington) or other qualified laboratory.

2.1 Sample Collection

Bulk samples of the soils in the "smear zone" impacted by LNAPL (from approximately 12 to 14 feet below ground surface) will be obtained from 6 locations at the Site, in the areas shown on Figure 2. These samples will be obtained by test pits using an excavator. The soil from the test pits will be placed on plastic sheets and mixed using the excavator bucket and/or shovels. Photographic documentation will be made of field conditions and the test pits during sampling.

Two 5-gallon buckets of soil from each test pit (total 60 gallons) will be shipped to ART Engineering in Tampa, Florida. One 55-gallon drum of soil from each test pit will be retained on-Site for possible future use.

2.2 Sample Compositing

ART Engineering will prepare three composite samples from the 60 gallons of soil collected for the bench testing. Performing three replicate washing tests will provide an indication of variability in the soils and the washing process. One of the replicate test results will be split to provide a duplicate sample for quality control.

2.3 Bench-Scale Testing

Figure 3 shows a flow diagram of the soil washing treatability study. This approach is designed to simulate the steps in the soil washing process. Each of the composite samples will be processed separately as indicated in this figure.

2.3.1 Soil Screening at 1/2" and Coarse Gravel Washing

Each of the three composite samples will be dry-screened at ½". The coarse gravel fraction will be washed using water at room temperature. Photographs will be taken before and after washing to document the effectiveness of this washing. In addition, a sample will be submitted for leachate testing (see Section 2.4).

2.3.2 Soil Washing

The soil fraction less than ½" will be processed through wet screening at 10 mesh and hydraulic separation at approximately 200 mesh to simulate the full scale soil washing process. The fines fraction and wash water will be flocculated and dewatered into the simulated filter cake. Three products will be generated:

- Washed gravel 10 mesh to ½"
- Sand after hydraulic separation
- Dewatered fines fraction

Laboratory analyses cannot be performed directly on gravel-size particles. Therefore, the washed gravel will be crushed to 95% passing 10 mesh before sending to the laboratory for chemical analysis (see Section 2.4) along with the other samples.

Three washing tests will be performed on the sand after hydraulic separation. The objective of the additional washing tests will be to determine the lowest possible hydrocarbon level in the sand through use of surfactants and/or elevated temperatures. These tests will be performed sequentially, and subsequent tests (with more aggressive/expensive treatment) may not be performed if sufficient cleanup is achieved in earlier test.

2.4 Laboratory Analyses

Table 1 shows the plan for chemical analysis. Refer to Figure 3 for sample designations.

In addition, a particle size distribution analysis using wet screening will be performed by ART Engineering on Sample "B" (the soil fraction less than ½"). The results will be mathematically corrected for amount of coarse gravel greater than 1/2" that was removed by the initial screening.

It is difficult to obtain meaningful direct analytical results (mg/kg) on soils with large particle sizes. Sample photographs before and after washing will document the effectiveness of washing the Site gravel. In addition, the Synthetic Precipitation Leaching Procedure (SPLP, EPA Method 1312) will be run on the washed gravel samples and analyzed for TPH.

3.0 SCHEDULE AND REPORTING

It is expected that this workplan will be approved no later than April 2009. If this is the case, then sample collection for this treatability study can start performed in the spring of 2009.

The soil washing study is expected to take approximately four weeks (excluding analytical time) from the time samples are obtained, plus an additional three weeks for laboratory analysis. The Treatability Study Report will be prepared within approximately one month of receipt of the analytical results.

A report will be prepared on completion of the testing, documenting the study methodology and results. Evaluation of the results will be performed in the EE/CA.

TABLES

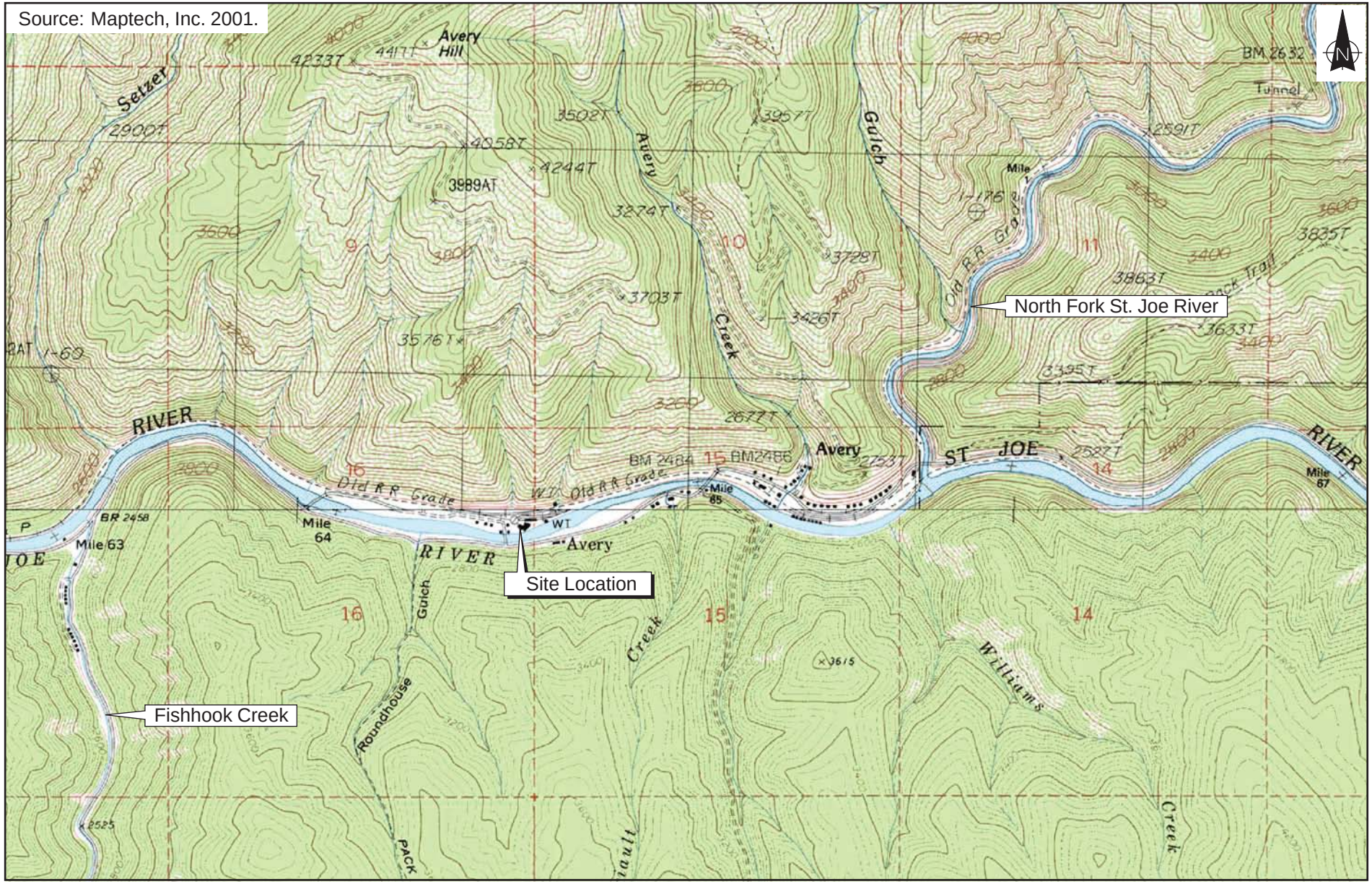
Treatability Study Analytical Plan

Sample	Sample ID	Moisture (% by weight)	TPH-diesel extended	Soil TOC	TPH-diesel on SPLP leachate	PAHs by GC/MS
Composite #1						
Washed gravel	Sample "A"				X	X
Soil fraction minus 1/2" (crushed)	Sample "B"	X	X	Note 3		X
Soil fraction minus 10 mesh (crushed)	Sample "C"	X	X	Note 3		
Washed Fine Gravel (+10 mesh - 1/2", crushed)	Sample "D"	X	X	Note 3		
Fines Filter Cake	Sample "E"	X	X	Note 3		X
Sand after Hydraulic Separation	Sample "F"	X	X	Note 3		X
Washed Sand - Test 1	Sample "G"	X	X	Note 3		X (see Note 2)
Washed Sand - Test 2	Sample "H"	X	X	Note 3		
Washed Sand - Test 3	Sample "I"	X	X	Note 3		
Composite #2						
Washed gravel	Sample "A"				X	X
Soil fraction minus 1/2" (crushed)	Sample "B"	X	X	Note 3		X
Soil fraction minus 10 mesh (crushed)	Sample "C"	X	X	Note 3		
Washed Fine Gravel (+10 mesh - 1/2", crushed)	Sample "D"	X	X	Note 3		
Fines Filter Cake	Sample "E"	X	X	Note 3		X
Sand after Hydraulic Separation	Sample "F"	X	X	Note 3		X
Washed Sand - Test 1	Sample "G"	X	X	Note 3		X (see Note 2)
Washed Sand - Test 2	Sample "H"	X	X	Note 3		
Washed Sand - Test 3	Sample "I"	X	X	Note 3		
Composite #3						
Washed gravel	Sample "A"				X	X
Soil fraction minus 1/2" (crushed)	Sample "B"	X	X	Note 3		X
Soil fraction minus 10 mesh (crushed)	Sample "C"	X	X	Note 3		
Washed Fine Gravel (+10 mesh - 1/2", crushed)	Sample "D"	X	X	Note 3		
Fines Filter Cake	Sample "E"	X	X	Note 3		X
Sand after Hydraulic Separation	Sample "F"	X	X	Note 3		X
Washed Sand - Test 1	Sample "G"	X	X	Note 3		X (see Note 2)
Washed Sand - Test 2	Sample "H"	X	X	Note 3		
Washed Sand - Test 3	Sample "I"	X	X	Note 3		

NOTES:

1. Refer to Soil Washing Treatability Study Flow Diagram for sample designations.
2. One sample will be selected from "G", "H", and "I" based on TPH results for PAH analysis.
3. Samples not meeting cleanup goals based on TPH-diesel will be analyzed for Soil TOC.

FIGURES

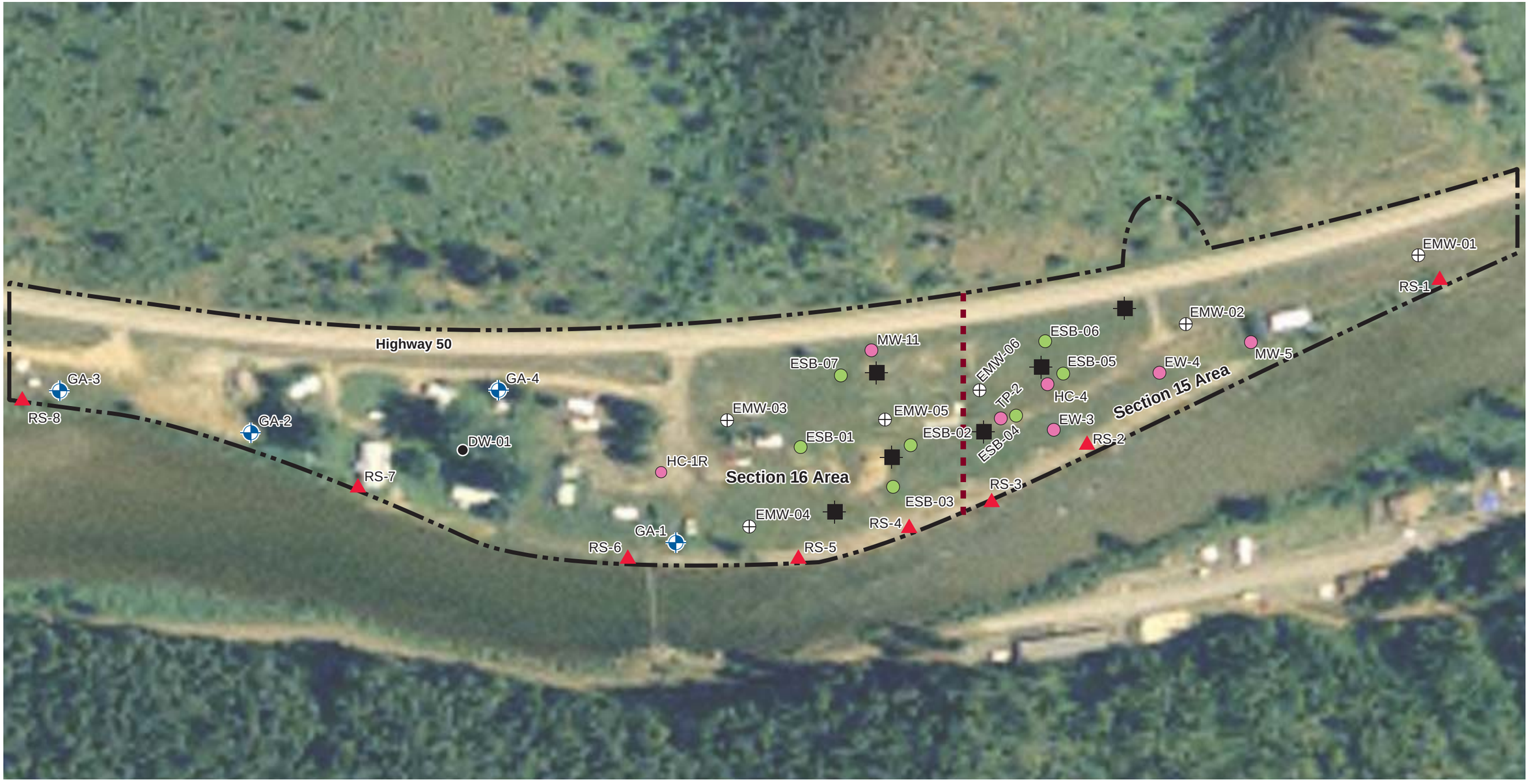


Source: Ecology and Environment, Inc., 2007

FIGURE **1**

SITE VICINITY MAP

TREATABILITY STUDY WORK PLAN AVERY LANDING SITE/WA



LEGEND

- Property Line & Section 16-15 Division Line
- Site Boundary
- EPA Monitoring Well
- EPA Soil Boring
- Monitoring Well
- Surface Water Sample Location
- Domestic Well
- Proposed EE/CA Monitoring Well
- River Sediment and Floating LNAPL and Surface Water Sampling Location
- Test Pits for Soil Sampling

0 140

APPROXIMATE SCALE IN FEET

FIGURE **2**

TREATABILITY STUDY SAMPLING LOCATIONS

TREATABILITY STUDY WORK PLAN AVERY LANDING SITE/WA

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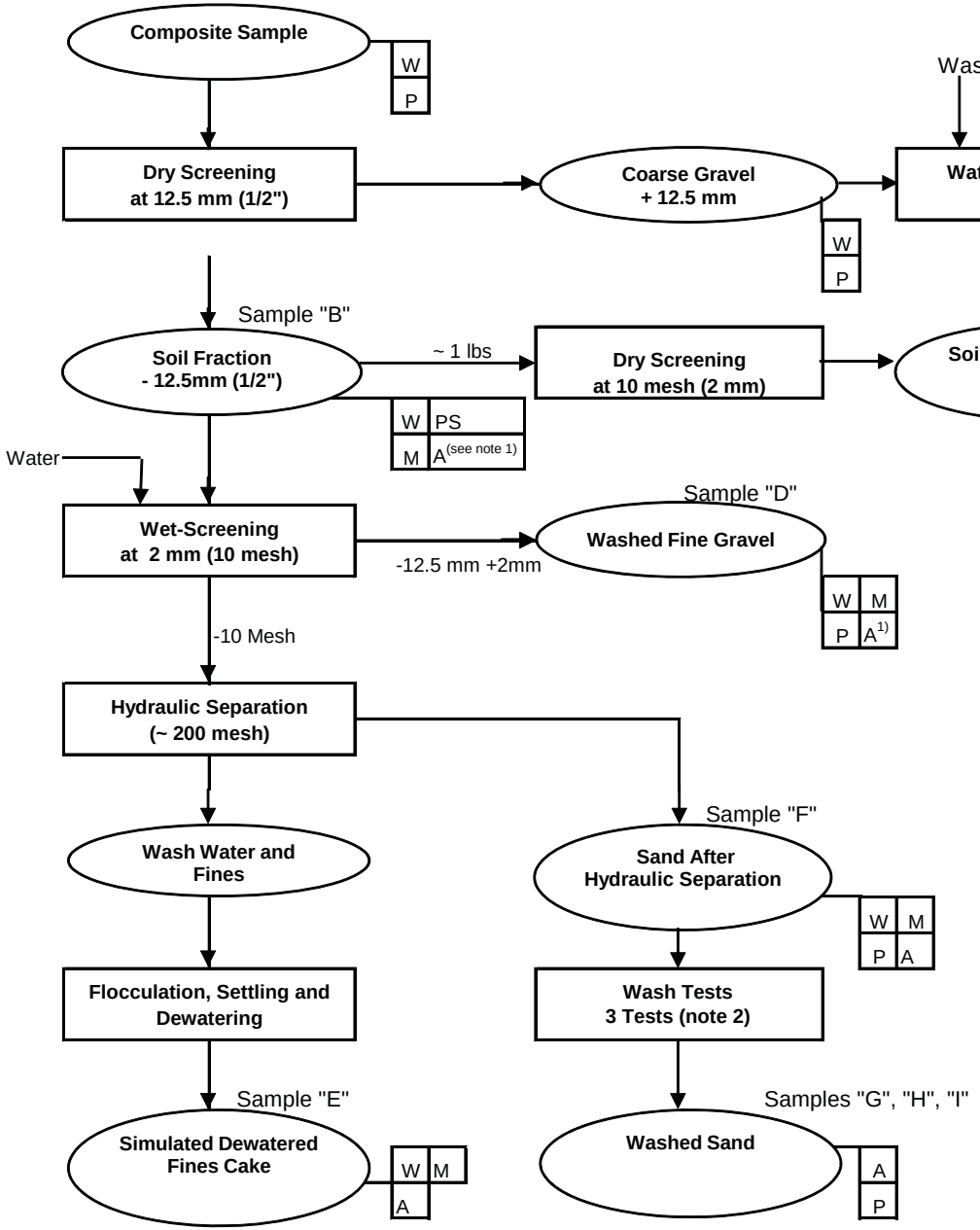

LEGEND

M	Moisture Content Determined
W	Weight Determined
PS	Particle Size Distribution Analysis
P	Photograph Taken
A	Analysis for TPH-diesel (extended range) and Select Samples for PAH (methods to be determined by Golder)
L	TPH-diesel Analysis of SPLP Leachate

(1) Sample Crushed to 95% Passing 2 mm (10 mesh) Screen

(2) Water, Surfactant and/or Elevated Temperature

Modification of Figure Provided by ART Engineering, LLC

FIGURE **3**
SOIL WASHING TREATABILITY STUDY FLOW DIAGRAM
POTLATCH/AVERY LANDINGEE/CAPLANS/ID